SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 1, 1896.—Absorption and emission of electric waves by resonance, by Max Planck. When a secondary circuit is excited by waves of a period equal to that of the circuit, resonance takes place. Three stages may be considered. In the first, the circuit absorbs energy from the external wave system until it has acquired a maximum of oscillation. The next stage is stationary, the circuit absorbing as much energy as is necessary to compensate for energy radiated and converted into heat. The third stage represents the dying out of the oscillation after the primary wave has ceased. Maxwell's equation enables us to calculate the distribution of energy during each of these stages.—Propagation of electric waves in water, by E. Cohn and P. Zeeman. The method used is an improvement on the apparatus previously employed, the parallel wires being taken through the trough of water and passing beyond it direct into the bolometer. The most important results are that for frequencies ranging from 27 to 97 millions no dispersion is observable, and that the index of refraction for such vibrations equals the square root of the dielectric constant.—On the alleged dissipation of positive electricity by light, by J. Elster and H. Geitel. The illumination of the anode in a vacuum leads apparently to a dissipation of an electric charge similar to that observed when a liquid alkali alloy is illuminated as a kathode. This is, however, due to the effect of the light on the platinum kathode or the interior of the tube after it has acquired a slight coating of alkali metal vapour. When this is obviated, no dissipation takes place.—Change of resistance of a contact by electric irradiation, by V. v. Lang. When a rod of carbon is lightly stood upon a block of carbon, a certain sensitive degree of contact may be found which abruptly diminishes in resistance when electric waves are produced in the neighbourhood, say by an influence machine or even an electrophorus. Any slight concussion tends to restore the original resistance. Similar results are obtained with zinc and aluminium, but the very least shock spoils the experiment in this case.—Longitudinal light, by G. Jaumann (see p. 374).—On the electric arc, by L. Arons. It is well known that an alternate current arc light is much more difficult to produce between metallic than between carbon electrodes. This may be due to the lower thermal conductivity of the carbon, which enables it to retain its heat while the current passes through wires, or to the volatile gases which are always given off by carbon, or to the oxidation of the metals during the passage of the current.

Symons's Monthly Meteorological Magazine, February.—The mild winter, by the editor. Figures are given to show that, though mild, there has been nothing very exceptional in the present winter, although it bears a great contrast to the severe frost of 1895. The temperature of December last in London was only about 1° above the average; the temperature of January 1896 was about 3° above the average, but it has been exceeded in eleven years out of the last thirty-six. In January 1884, the lowest air temperature was 32°·2, and the whole month was 3° warmer than January 1896.—The high monthly mean pressure in January. The mean for the month in Camden Square was 30·360 inches. This has only been exceeded twice since the Camden Square record began in 1858, viz. in January 1880, when the mean was 30·370 inches, and in February 1891, when it was 30·472 inches. A table is given showing the high monthly pressures of 30·360 inches or upwards in the vicinity of London since 1779. This value has only been reached or exceeded on nine occasions, and the mean of February 1891, above quoted, is the highest.

SOCIETIES AND ACADEMIES.

London.

Royal Society, January 16.—"Memoir on the Theory of the Partitions of Numbers." Part I. By Major P. A. MacMahon, R.A., F.R.S.

This memoir presented is a natural sequel to the memoirs of 1891, 1893, and 1894, published *in extenso* in the *Philosophical Transactions*. In fundamental idea it is graphical, resting, on the one hand, upon the method of the memoir on the "Compositions of Numbers," of 1893, and, on the other, upon Sylvester's graphical method, set forth in his "Constructive Theory of Partitions," of 1882, published in vol. v. of the *American Journal of Mathematics*.

The memoir is divided into four sections. In § 1 the author gives new notions concerning the partitions of ordinary unipartite numbers, and shows that the theory of the separations of a partition necessitates the consideration of the partitions of multipartite numbers. The two theories proceed in parallel paths. One-to-one correspondence can be established at any point.

In § 2 he is engaged with the graphical representation of unipartite partitions. The graph that, in the memoir of 1893, was employed to denote a principal composition of a bipartite number is shown to be the graph also of a unipartite partition.

A new theory of unipartite partitions is evolved with algebraical developments in correspondence.

In § 3 he investigates a similar correspondence between the compositions of tripartite numbers and certain regularised partitions of bipartite numbers.

The method is of general application, and indicates a one-to-one correspondence between the compositions of $m+1$-partite numbers and contain regularised partitions of m-partite numbers.

In § 4 he takes up the question of the graphical representation of completely regularised multipartite numbers. He follows Sylvester, proceeding from two to three dimensions. Whereas Sylvester employed nodes in a two-dimensional corner, the author employs nodes piled up in a three-dimensional corner. Sylvester obtains a two-fold correspondence from the permutations of his axes x, y. The author obtains a six-fold correspondence from the permutations of the three axes x, y, z. Even Sylvester's two-dimensional graphs permit of six interpretations when viewed from the three-dimensional standpoint.

Physical Society, February 28.—Prof. John Perry, Vice-President, in the chair.—Sir D. Salomons showed some experiments with incandescent lamps. A large electro-magnet is excited by means of a continuous current, while an alternating current is passed through an incandescent lamp. On bringing the lamp near the magnet the filament is set in vibration, which, if the lamp is brought sufficiently near the magnet, is sufficiently intense to break the filament. The number and position of the nodes formed in the vibrating filament are found to be independent of the natural period of the filament, but depend on the frequency of the alternating current. Prof. S. P. Thompson asked whether it was not found that the number of segments into which the filament divides, depended to some extent on the natural period of the filament. Prof. Ayrton said that the magnetic leakage was very large with the arrangement adopted, and he would like to know whether this method was a more sensitive one for mapping out the field than those ordinarily employed. In an instrument designed by Prof. Perry and himself, an alternating current was passed through a wire stretched between the poles of a magnet, and the tension of the wire was altered till the vibrations set up were a maximum. The natural period of the wire, and hence the frequency of the alternating current, was then deduced from the tension, &c. In Prof. Ewing's magnetic curve tracer, on the other hand, the natural period of the stretched wire was made as different as possible from the period of the alternations which were to be observed, so that the natural vibrations of the wire did not influence the results. The author's arrangement appeared to him (Prof. Ayrton) to be intermediate between these two, and it would seem that the natural period of the filament would to a certain extent influence the results. Prof. Perry suggested that the lamp might be held in a very steady support, so that after the large vibrations due to the natural period of the filament had died out, the vibrations of the period of the alternations alone could be observed. Sir D. Salomons, in his reply, said that the arrangement was not intended for making *measurements*. A lamp had been fixed in a steady clamp, and the current passed for many hours, but the character of the vibrations remained unaltered. He had found the vibrating filament useful for microscope work where a surface rather than a line of light was required.—Prof. Fleming read a paper by himself and Mr. Petavel, on an analytical study of the alternating current arc. The first part of the paper consisted of an analytical study of the distribution of light throughout the various radiating regions in the arc, when supplied with electric power of known constant amount, the periodic variations of the current through the arc and of the potential difference between the carbons being at the same time recorded. The power was measured by means of a bifilar watt-meter; while by means of a series of mirrors and a rotating disc carried by a synchronising alternate current motor, the mean value of the light taken from any part of the arc was compared with the instantaneous value of the light taken from the same part of the arc, and taken at any assigned instant during the period. Thus the arc itself was its own standard, and difficulties due to slow variations in the mean light of the arc disappear. The facts observed may be summed up as follows:—The purple light of the true arc undergoes a periodic variation, and, as far as the eye can judge, is completely extinguished for a certain interval during the phase; it has equal maxima values during the period, at instants slightly lagging behind the instants of maximum power expenditure in the arc. On the other hand, the illuminating power of the carbon crater varies between a minimum value and two unequal maxima; the greater maximum occurring when the carbon is positive, and an instant slightly lagging behind the instant of maximum power expenditure in the arc. The second part of the paper consisted of a comparison of the efficiency of the alternate current arc regarded as a light-giving agent, as compared with that of a continuous current arc taking the same mean power. Using two arcs, which may be regarded as typical of those used in practice, the mean spherical candle-power was compared for equal expenditure of power in the arcs; and it was found that for the alternating current arc employed the total mean spherical candle-power was always less than that of the continuous current arc. Lowering the frequency seemed to decrease the efficiency of the alternating current arc. Prof. Ayrton said the behaviour of the alternate current arc was of great interest, for the power supplied could not be measured by simply multiplying the current by the electro-motive force, since the current lags behind the volts. The resistance, *i.e.* the ratio of the current to the E.M.F., also lags, but the authors do not appear to have made any attempt to measure the *true* resistance. The authors were to be congratulated on the guarded tone they had adopted as to the bearing of these experiments on the question of the relative efficiency of the alternating and continuous current arcs. In a previous communication, one of the authors had stated that the alternating current arc must necessarily be a less efficient light-producing agent than the continuous current arc. Although the last set of curves given in the paper might appear to support this supposition, he (Prof. Ayrton) felt that the difference obtained was probably due to the fact that the alternating current arc was not being worked under proper conditions. The quality of the carbons and the length of the arc have a most important influence on the efficiency of an arc. At present our knowledge is not sufficient to allow of our stating definitely whether or not an alternating current arc can be made as efficient as a direct current arc, but there is no doubt that it will be possible to get much better results than are at present attainable. Prof. S. P. Thompson said that when the fact of the existence of the difference in phase between the current and volts in an alternating arc was first published, he had made some experiments which showed that there was a lag and not a lead, *i.e.* that the arc acted as if it possessed self-induction. The resistance also lagged, and he thought this lag might be due to a thermal lag. The temperature of the arc will lag behind the current, both when it is increasing and when it is decreasing, and if the resistance of the arc depends on the temperature of the vapour in the arc, then the resistance would also lag behind the current. It was not possible from *à priori* reasoning to say whether or no an alternating current arc could ever be obtained of an efficiency equal to that of the direct current arc. With suitable carbons, length of arc, current and volts, it seemed to him that it might be possible to obtain an equal efficiency. The light-giving process in an arc is not merely an irreversible degradation of electric energy into heat, for the difference of potential between the carbons may be written $V = a + bl$, where a may be regarded as a back electro-motive force and bl as a true resistance. The first term of this expression does not vary with the length of the arc (l), but the second term does. Multiplying through by the current (C), the equation: Watts expended $= Ca + Cbl$, is obtained. It is the first of the terms on the right-hand side, which is a reversible effect, and corresponds to the power expended in driving the current against a back electro-motive force, on which the light given out chiefly depends, due to something occurring at the crater surface. Mr. Blakesley asked whether Prof. Thompson's idea of the light being due to the reversible part of the process was not a strong argument in favour of the direct current arc. Prof. Ayrton said that in two communications made to the congress held at Chicago, it was shown that even with direct current arcs there was a certain length of arc for which the efficiency was a maximum. Mrs. Ayrton had quite recently found that the efficiency of arc-lamp carbons altered with time. Prof. Thompson's suggestion as to a thermal lag was a valuable one. Prof. Fleming, in his reply, said that when comparing two agents where there were so many variables it was practically necessary to restrict the investigation. In their case they had kept the mean power constant, and had left the other variables to take care of themselves.—The Society then adjourned till March 13.

PARIS.

Academy of Sciences, February 24.—M. A. Cornu in the chair.—On partial differential equations of the second order with imaginary characteristics, by M. E. Picard.—On the radiations emitted by phosphorescence, by M. H. Becquerel. An experimental proof of the fact that light emitted by phosphorescent substances possesses the power of affecting a photographic plate through a screen which is opaque to sunlight.—On the carbide of manganese, by M. H. Moissan. This carbide, Mn_3C, which is easily prepared in the electric furnace from Mn_3O_4 and sugar charcoal, differs from other metallic carbides in the simplicity of its reaction with water, which proceeds thus,

$$Mn_3C + 6H_2O = 3Mn(OH)_2 + CH_4 + H_2.$$

Neither acetylene nor liquid hydrocarbons being formed.—Study of the borides of nickel and cobalt. The borides, NiB, CoB, are easily obtained in the crystalline state from the metal and boron at 1200°, their properties being very similar to those of the iron boride previously described.—On the estimation of arsenic, by M. A. Gautier. A criticism of a paper by MM. Engel and Bernard upon the same subject.—On a colloidal substance elaborated by the lymphatics in the normal state, by M. L. Ranvier.—The relation between muscular work and the albuminoid materials of the body, by M. A. Chauveau.—An experimental study of the question as to whether albuminoids take part in the production of external work. The results show that the amount of nitrogen secreted is practically the same whether the animal is doing external work or not, and thus confirming the conclusion drawn by the author from previous experiments, that it is by the combustion in the muscle of carbohydrates that the energy necessary for external work is produced.—On the corals of the Gulf of Lyons, by M. de Lacaze-Duthiers. A communication from the Arago Biological Laboratory.—On the method employed for conferring immunity from the venom of serpents, from documents furnished by M. de Serpa Pinto, by M. d'Abbadie. A question of priority.—Observations of Venus on Mount Mounier, by M. Perrotin. The results of these observations, which were made under very favourable conditions at a height of 9000 feet above sea-level, are consistent with the slow rotation discovered by M. Schiaparelli.—On the conversion of dextro-rotatory camphoric acid into dextro-rotatory camphor, by M. A. Haller.—Analysis, by volumetric methods, of a mixture of chlorides, hypochlorites, and chlorates, by M. A. Carnot.—Analysis of a mixture of chlorides, chlorates, and perchlorates, by M. A. Carnot.—Observations on the new Perrine comet (1896, Feb. 15) made at the Observatory of Lyons, by M. G. Le Cadet.—Observations on the same, made at the Observatory of Toulouse, by M. F. Rossard.—On the production of Röntgen silhouettes, by M. C. V. Zenger.—On the action of the X-rays on the diamond, by MM. A. Buguet and A. Gascard. The transparency of the diamond and of jet to the Röntgen rays renders it very easy to distinguish them from their imitations, the latter being opaque.—On the cause of the invisibility of the Röntgen rays, by MM. Dariex and de Rochas. It was found that the media of the eye, although perfectly transparent to ordinary light, are nearly opaque to the X-rays.—On the Röntgen rays, by M. G. Meslin.—On some properties of the X-rays of M. Röntgen, by M. H. Dufour. The phenomena are compared to the silent discharge.—On the emission of the Röntgen rays by a tube containing a fluorescent substance, by M. Piltchikof. The length of exposure may be much reduced under these conditions.—On some properties of dark light, by M. G. Le Bon.—On photography through opaque bodies, by MM. A. and L. Lumière. The authors, in attempting to repeat the experiments of M. G. Le Bon, obtained entirely negative results.—On the properties of metals extracted from their amalgams, by M. Guntz (see Note, p. 423).—Action of some hydrogen compounds on sulphuryl chloride, by M. A. Besson. The reactions with hydrogen sulphide, bromide, iodide and phosphide were studied.—On the dry distillation of wood by

M. E. Barillot.—On the temperature of the sparks produced by uranium, by M. Chesneau.—On a new mode of formation of nitroprussides, by MM. C. Marie and R. Marquis. A mixture of an alkaline ferrocyanide and nitrite is treated with carbon dioxide.—On a crystallised ammonio-chromous carbonate, by M. G. Baugé.—On veratrylamine, by M. C. Moureu.—Thermochemical study of orthochlorobenzoic acid and some of its derivatives, by M. P. Rivals.—Conversion of formaldehyde solution into vapour for disinfecting purposes, by M. A. Trillat.—On the Cretaceous fossils of Madagascar, by M. C. Deperet.—Modifications in the structure of some Arthropods induced by their living in caves, by M. A. Viré.—On phagocytosis in the oyster, by M. J. Chatin.—On the combined action of light and water in the disengagement of the perfume of plants, by M. E. Mesnard.—Method for preventing the darkening of cider, by MM. L. Dufour and L. Daniel.

DIARY OF SOCIETIES.

London.

THURSDAY, March 5.

Royal Society, at 4.30.—Contributions to the Mathematical Theory of Evolution. Note on Reproductive Selection: Prof. Karl Pearson.—On the Diurnal Periodicity of Earthquakes: C. Davison.

Royal Institution, at 3.—Masters of Modern Thought. I. Voltaire: Rev. William Barry.

Linnean Society, at 8.—Segmentally-disposed Thoracic Glands in the Larvæ of Trichoptera: Prof. Gustav Gilson.

Chemical Society, at 8.—On the Explosion of Cyanogen: H. B. Dixon, E. H. Strange, and E. Graham.—On the Mode of Burning of Carbon: H. B. Dixon.—On the Detonation of Chlorine Peroxide: H. B. Dixon and J. A. Harker.—The Constitution of a New Acid resulting from the Oxidation of Tartaric Acid: H. J. H. Fenton.

Society of Antiquaries, at 8.30.

FRIDAY, March 6.

Royal Institution, at 9.—The Tunnel under the Thames at Blackwall: A. R. Binnie.

Royal Geographical Society, at 4.30.—A Plan for the Geographical Description of the British Islands on the Basis of the Ordnance Survey: Dr. Hugh Robert Mill.

Geologists' Association, at 8.—"Pebbly Gravel" from Goring Gap to the Norfolk Coast: A. E. Salter.—On some Pleistocene Ostracoda from Fulham: Frederick Chapman.

Quekett Microscopical Club, at 8.

SATURDAY, March 7.

Royal Institution, at 3.—Light: Lord Rayleigh, F.R.S.

SUNDAY, March 8.

Sunday Lecture Society, at 4.—The New Far East; the War between China and Japan: its True Meaning and its Results: Arthur Diósy.

MONDAY, March 9.

Royal Geographical Society, at 8.30.—On the Country of the Shans: Colonel R. G. Woodthorpe, C.B., R.E.

TUESDAY, March 10.

Royal Institution, at 3.—The External Covering of Plants and Animals: Prof. Charles Stewart.

Society of Arts, at 8.—English Book Illustrations, 1860-70: Joseph Pennell.

Institution of Civil Engineers, at 8.—Paper to be further discussed: On Littoral Drift in relation to River-Outfalls and to Harbour-Entrances: W. H. Wheeler.——Papers to be read, time permitting: The Lixiviation of Silver Ores: J. H. Clemes.—Mining and Treatment of Copper Ore at Tharsis, Spain: C. F. Courtney.—Tin Smelting at Pulo Brani, Singapore: Messrs. J. McKillop and T. Flower-Ellis.

Anthropological Institute, at 8.30.—Some Account of the Shans and Hill Tribes of the States on the Mekong: Colonel R. G. Woodthorpe.

Royal Photographic Society, at 8.—Notes on Medical Photo-micrography: Edmund Roughton and Charles Cosens.

Royal Victoria Hall, at 8.30.—Railways and Railway Men: Sidney H. Wells.

King's College Free Lectures, at 8.—Romance of Plant Life: Prof. Bottomley.

WEDNESDAY, March 11.

Society of Arts, at 8.—Peasant Life and Industries in Ireland: Prof. A. C. Haddon.

Geological Society, at 8.—On an Alpine Nickel-bearing Serpentine with Fulgurites: Miss E. Aston, with Petrographical Notes by Prof. T. G. Bonney, F.R.S.—The Pliocene Glaciation, Pre-Glacial Valleys, and Lake-Basins in Subalpine Switzerland: Dr. C. S. du Riche Preller.—Notes concerning certain Linear Marks in a Sedimentary Rock: Dr. J. E. Talmage, F.R.S.

Pharmaceutical Society, at 8.30.

THURSDAY, March 12.

Royal Society, at 4.30.—Croonian Lecture: Observations upon Isolated Nerve: Dr. A. D. Waller, F.R.S.

Mathematical Society, at 8.—On the Enumeration of Groups of Totitives: Prof. Lloyd Tanner.—(1) The Catenary on the Paraboloid and Cone; (2) The Motion of the Top: Prof. Greenhill, F.R.S.

Institution of Electrical Engineers, at 8.—High-Voltage Lamps and their Influence on Central Station Practice: G. L. Addenbrooke.

Society of Antiquaries, at 8.30.

FRIDAY, March 13.

Royal Astronomical Society, at 8.

Physical Society, at 8.

Malacological Society, at 8.

Institution of Civil Engineers, at 8.—Tests of Centrifugal Pumps: J. C. Cornock.

SATURDAY, March 14.

Royal Institution, at 3.—Light: Lord Rayleigh, F.R.S.

Royal Botanic Society, at 3.45.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—Annuaire de l'Observatoire Royal de Belgique, 1896 (Bruxelles).—Elements of Botany: J. Y. Bergen (Ginn).—The Geology and Scenery of Sutherland: H. M. Cadell, 2nd edition (Edinburgh, Douglas).—A Contribution to our Knowledge of Seedlings: Sir J. Lubbock, popular edition (K. Paul).—Life, Letters, and Works of Louis Agassiz: J. Marcou, 2 Vols. (Macmillan).—Grundriss der Psychologie: W. Wundt (Leipzig, Engelmann).

Pamphlets.—Report on the Scientific Study of the Mental and Physical Conditions of Childhood (London).—Esperienze coi Raggi di Roentgen: J. Vicentini and G. Pacher (Venezia).—Hermann von Helmholtz's Untersuchungen über die Grundlagen der Mathematik und Mechanik: Dr. L. Koenigsberger (Leipzig, Teubner).—Travaux du Réseau Météorologique du Sud-ouest de la Russie, 1894: A. Klossovsky (Odessa).—Annales de l'Observatoire Météorologie de l'Université Impériale de Odessa, 1894: A. Klossovsky (Odessa).

Serials.—Journal of the College of Science, Imperial University, Japan, Vol. viii. Part 2; Vol. ix. Part 1 (Tōkyō).—Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie, Einundzwanzigster Band, 4 Heft (Leipzig, Engelmann).—Himmel und Erde, February (Berlin, Paetel).—Bulletin de la Société Imperiale des Naturalistes de Moscou. 1895, No. 3 (Moscou).—The Photographic Times, February (New York).—Sunday Magazine, March (Isbister).—Good Words, March (Isbister).—Longman's Magazine, March (Longmans).—Quarterly Journal of Microscopical Science, February (Churchill).—Chambers's Journal, March (Chambers).—National Review, March (Arnold).—Century Magazine. March (Macmillan).—Natural Science, March (Rait).—Humanitarian, March (Hutchinson).—Zeitschrift für Physikalische Chemie, xix. Band, 2 Heft (Leipzig, Engelmann).—Transactions of the American Microscopical Society, January (Buffalo).—Contemporary Review, March (Isbister).—Scribner's Magazine, March (S. Low).—History of Mankind: F. Ratzel, translated, Part 6 (Macmillan).—Bulletins de la Société d'Anthropologie de Paris, 1896, Fasc. 5 (Paris, Masson).—Fortnightly Review, March (Chapman).

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